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ABSTRACT

This paper describes a study designed to test the generalizability of Holland's hexagonal model of vocational interest structure in a Chinese culture. It was hypothesized that the results of multidimensional scaling would support Holland's hexagonal model of vocational interests. The instrument used was the Chinese Vocational Interest Inventory. Eight hundred and thirty-one college students completed the inventory and the obtained data were analyzed by the Multidimensional Scaling. The results indicated that the order of the six interest types on the two dimensional space was R-I-A-S-E-C for both males and females. Holland's hexagonal model was supported and could be used to interpret the interest structure of Taiwanese college students. (Author/EH)

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# A Study of Holland's Model in Taiwan

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## ABSTRACT

The purpose of the study was to test the generalizability of Holland's hexagonal model of vocational interest structure in a Chinese culture. It was hypothesized that the results of multidimensional scaling would support Holland's hexagonal model of vocational interests. The instrument used in this study was the Chinese Vocational Interest Inventory. Eight hundred and thirty-one college students completed the inventory and the obtained data were analyzed by the Multidimensional Scaling. The results indicated that the order of the six interest types on the two dimensional space was R-I-A-S-E-C for both males and females. Holland's hexagonal model was supported and could be used to interpret the interest structure of Taiwanese college students.

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# A Study of Holland's Vocational Model inTaiwan

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Vocational interest is one of the important factors that influence an individual's vocational choice. Over the past few decades, several models of vocational interest structure have been proposed: Roe's (1954) circular model, Holland's (1973, 1985a) hexagonal model, the World of Work Map developed by the American College Test Program(Prediger, 1976), and Gati's (1979) hierarchical model. The purposes of the study was to explore the Taiwanese college students' vocational interest structure. Holland's hexagonal model was examined to see if it is useful in interpreting the Taiwanese college students' interest structure.

Holland's model is widely used in counseling practice in the United States because of its simplicity. He assumed that there are six personality types: Realistic(R), Investigative(I), Artistic(A), Social(S), Enterprising(E), and Conventional(C). The six types could be arranged as a hexagon on the two-dimensional space according to their resemblance to one another. The order of the six types on a two-dimensional space is R-I-A-S-E-C.

Holland's hexagonal model has been incorporated into vocational counseling practice with a variety of populations such as high school students, college students, and various ethnic groups. The model's heuristic value for counseling practice has been illustrated by many research studies; however, the construct validity and generalizability of the model are still questioned by recent research (Droz, 1990). Tinsley (1992) also suggested that more attention should be paid by the vocational psychologists with regard to the cross-cultural generalizability of Holland's vocational interest model.

Career counseling is more and more important for college students in Taiwan because the society there is shifting rapidly in its economic, political, and educational development. The need for college students to explore their vocational interests is increasing. In Taiwan, the college students have to choose their majors when they take the College Entrance Examination. Some of the students may think of changing their majors one or two years after they enter colleges. Therefore, career counseling is important for college students, especially for those who want to change majors.

In this study, the construct validity of Holland's hexagonal model of vocational interest structure were tested in a Chinese culture. It was hypothesized that the results of multidimensional scaling would support Holland's hexagonal model of vocational interests. Holland's hexagonal model could be used to interpret the Taiwanese college students' vocational interest structure.

## METHODS

### Participants

A two-stage cluster sampling procedure was used to select the participants. Nine colleges or universities were first selected from 34 universities and colleges in Taipei area. Twelve college majors across the six interest types in Holland's hexagonal model, two in each type, were then selected from the major list classified by Holland (1966).

The twelve majors selected were mechanical engineering, chemical engineering, mathematics, chemistry, drama, sculpture art, social work, child welfare, political science, economics, accounting, and finance. Eight hundred and thirty one students completed the questionnaires( 366 males and 465 females).

### Instrument

The instrument used in the study was the Chinese Vocational Interest Inventory. It is a forced-choice format inventory with 120 questions in activities section and 60 questions in occupations section, totaling 180. The inventory includes six scales: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. The estimated reliability coefficients of the six scales range from .66 to .94 for the male and range from .68 to .90 for the female.

As far as the criterion validity, the percentage of hits, using the current college major as the criterion variable, is 45.9% for males and 50.5% for females, which is considered an excellent hit rate according to the criterion set by Hansen and Campbell (1985). The results of convergent-discriminant validity tested by using the Multi-Trait Multi-Method (MTMM) indicated that the convergent coefficients were in general greater than the discriminant coefficients. These data support the validity of the Chinese Vocational Interest Inventory. The data for reliability and validity tests were based on the sample of 831 Taiwanese college students, composed of 366 males and 465 females.

### Data Analysis

Multidimensional scaling (MDS) was conducted to examine Holland's model of vocational interest structure. The MDS is designed to analyze distance-like data that indicate the degree of dissimilarity (or similarity) of two objects. It has its origins in psychometrics where it was proposed to help understand people's judgements of the similarity of members of a set of objects.

Davison (1985) compared MDS to factor analysis and suggested that the MDS is a more parsimonious solution than the factor analysis is. MDS can often represent the structure on fewer dimensions than can factor analysis although both can be used to study the structure of objects. Guilford (1952) identified some common faults in the use of factor analysis. He criticized correlation coefficients used in factor analysis as often spurious, especially in the case of ipsative scales. He asserted that correlations of ipsative scores should not be factor analyzed. In this study, the ipsative scales were used in the Chinese Vocational Interest Inventory and the correlation matrix can not be analyzed by the confirmatory factor analysis. However, MDS was used to analyze the underlying structure of the college students' vocational interests in Taiwan.

The classical nonmetric MDS was used in this study to examine the relationship among the six vocational interest types proposed by Holland in a two dimensional space. The Euclidean distance among the six interest types were first calculated and then used by the MDS to create the stimulus coordinates for the six interest types. The locations of the six interest types were then indicated on the two-dimensional space according to the stimulus coordinates.

According to Fouad and Dancer (1992), the fit of an MDS solution to an observed matrix typically can be assessed by one of two inverse measures of goodness-of-fit, the coefficient of alienation (COA; Guttman, 1968) or Kruskal's (1964) stress Formula One. Large values of either index indicated that the specified number of dimensions inadequately accommodates the observed relations among the variables and suggests the need for a solution space of higher dimensionality. Near zero values of either index indicate a good fit of the MDS solution to the observed data. Kruskal (1964) offered guidelines as to what "good" stress values should be in the typical nonmetric application: .20=poor, .10=fair, .05=good, .025=excellent, and 0.0=perfect. In this study, Kruskal's stress Formula One was used as the index of goodness of fit. RSQ, the squared correlation between the data and the distances, is an additional index to examine the fit of the model to the observed data. It can be interpreted as the proportion of variance of the

transformed data that is accounted for by the distances of the MDS model. It was also used in this study.

## RESULTS

Means and standard deviations of the six interest scales on the Chinese Vocational Interest Inventory are listed in Table 1. The data were based on 366 male and 465 female college students. Table 2 indicates the correlations between pairs of interest types on the Vocational Interest Inventory, with male data below the diagonal and female data above the diagonal. Many of the negative values are due to the forced-choice format of the developed Chinese Vocational Interest Inventory.

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Insert Table 1 and Table 2 about here

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Table 3 shows the ALSCAL solutions for the male and female data obtained from the Chinese Vocational Interest Inventory. Those stimulus coordinates identify the locations of the six vocational interest types on a two-dimensional space.

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Insert Table 3 about here

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Figure 1 presents the two-dimensional configuration for male data obtained from the Chinese Vocational Interest Inventory. The stress value is 0.027 and the RSQ is 0.995. Figure 2 is the two-dimensional configuration for the structure of the Chinese Vocational Interest Inventory based on the sample of 465 college females. The stress value is 0.019 and the RSQ is 0.998. According to the criterion proposed by Kruskal (1964), the stress values 0.027 and .019 are both excellent. It means that the configurations presented in Figure 1 and Figure 2 fit the data collected in this study. The RSQ values 0.995 and 0.998 indicated that about 99% of the variance of the transformed data could be accounted for by the distances of the MDS solutions.

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Insert Figure 1 and Figure 2 about here

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## DISCUSSION

Similar to some of the cross-cultural studies(Dancer, 1992; Swanson, 1992), the results of the MDS analysis confirmed the ordering of Holland's hexagonal model. A two-dimensional ALSCAL solution was employed and the results confirmed the order of R-I-A-S-E-C on the two-dimensional space, with male's data in a clockwise order and female's counterclockwise.

Compare to the cross-cultural studies conducted in Hebrew culture (Feldman & Meir, 1976; Meir and Ben-Yehuda, 1976), results of the present study suggest that Holland's hexagonal model has better potential applicability in the Chinese culture. The MDS research conducted by Meir and his colleagues provided little support for Holland's hypothesized interest structure. Cultural differences may account for the failure to find the hypothesized interest structure. The age of the samples was one important factor, too. The samples they used were high school students. In this study, the samples were college students. The vocational interests of college students may be more clearly defined than that of high school students.

Some of the findings in this study were similar to Jin's (1986) study, which confirmed Holland's model of vocational interest structure in Taiwan. However, the sample in Jin's study was based on high school students. Results of the present study further verified the applicability of Holland's model for college students in Taiwan.

In this study, in the two-dimensional space, Realistic and Investigative types were closer to each other than either of them was to any of the other four types. This is true for both male and female samples. In Jin's study, the results of factor analysis also indicated that R and I were closer to each other. The A, S, E, and C types formed another group on the two dimensional space. For the high schools, most of the students could be classified into two groups, the natural sciences and humanistic-social sciences. This kind of differentiation is partly due to the fact that the students in Taiwan have to decide between the two groups (natural sciences or humanistic-social sciences) before the end of their first year at high school. For college students, they have to decide their majors before they enter the college. The differentiation between natural science and humanistic-social sciences is even clearer.

### *Implications for Theory*

Holland's hexagonal model has been examined in many countries in the past few years. Most of the studies tried to verify the applicability of the model in different cultures or tried to seek how to refine the hexagonal model based on the different

cultures. Results of the present study verified the generalizability of the hexagonal structure in Taiwan although the hypothesized equilateral hexagonal needs some modification.

Holland's equilateral hexagonal model could be modified based on the results of MDS analysis in the following ways. First, the fact of unequal differences between adjacent types in the hexagon should be accepted. Second, Realistic and Investigative types of interests were so close to each other on the two-dimensional configuration that they could be clustered into one group. Third, the other four interest types, Artistic, Social, Enterprising, and Conventional, formed another group of interests on the two-dimensional configuration. To further examine whether the four interest types could be divided into two subgroups, a cluster analysis needs to be conducted. It may be that Artistic should constitute a separate cluster, and Social should join the cluster of Enterprising and Conventional. It is also possible that A and S are in one cluster and E and C are in another group.

***Implications for Counseling***

In the United States, it was suggested by previous cross-cultural studies that counselors should be aware of the various linguistic and cultural factors that influence the vocational interests of college students. In Taiwan, the counselors also need to notice the cultural differences when they use theories or instruments from other cultures. This awareness could enable counselors to better assist students who are planning their careers.

The Chinese Vocational Interest Inventory was based on Holland's theory of vocational interests. Results of reliability and validity tests indicated that it is a useful inventory for college students in Taiwan. Holland's theory is applicable in the process of results interpretation. However, the counselors should keep in mind that the Chinese Vocational Interest Inventory measures likes and dislikes, not abilities.

***Implications for Future Research***

Two suggestions are proposed for future research. First, a broad sample across the six vocational interest types is suggested for future study. The sample used in this study for validity test included 831 college students from 12 majors. A broader sample from more than 12 majors would increase the clarity of the six interest types on the two-dimensional configuration.

Second, defining codes for occupations and college majors would improve the applicability of the Chinese Vocational Interest Inventory. The Occupations Finder

(Holland, 1985d) summarizes the classifications of occupations according to the hexagonal model. Each of the occupations in the Occupations Finder was assigned a 9-digit number which is the same as the one in the Dictionary of Occupational Title (DOT). The connection between the SDS and the DOT provides the students with the opportunity to find more information about the occupations from the DOT. In the College Major Finder (Holland, 1985e), a three-letter code is assigned to each of the college majors. The students who are major-undecided would be able to obtain concrete information about college majors in which they might be interested. The similar classification systems would be valuable to create for Taiwanese college and high school students.

To summarize, results of the present study confirmed the ordering of Holland's hexagonal model. For counseling practice, Holland's hexagonal model can be used in the process of test interpretation. For future research, some of the suggestions include the establishment of the occupation and college major classification systems. Implications of these results also suggest the modification of Holland's model for vocational interest theory.

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Table 1

Means and Standard Deviations of the Six Interest Variables for Males (N=366) and Females (N=465)

| | | R | I | A | S | E | C |
|---|---|---|---|---|---|---|---|
| Males | M | 31.28 | 30.73 | 26.33 | 29.47 | 35.04 | 27.14 |
| | SD | 11.51 | 12.00 | 12.18 | 11.08 | 11.92 | 92.83 |
| Female | M | 19.01 | 25.43 | 35.52 | 36.56 | 33.06 | 30.42 |
| | SD | 9.05 | 10.02 | 10.65 | 11.45 | 10.00 | 11.22 |

Table 2

Correlation coefficients between pairs of interest types in the Chinese Vocational Interest Inventory

| Scales | R | I | A | S | E | C |
|---|---|---|---|---|---|---|
| R | | 3930 | -2109 | -3770 | -4165 | -2013 |
| I | 4287 | | -2179 | -3107 | -4036 | -3270 |
| A | -2730 | -3800 | | -1462 | -0787 | -3650 |
| S | -4614 | -2695 | -0678 | | -1175 | -1951 |
| E | -5881 | -5725 | 0001 | 0338 | | -0003 |
| C | -1231 | -2543 | -3789 | -2151 | 1373 | |

Note. Decimal points omitted. Correlations for males (N=366) are shown below the diagonal, and correlations for females (N=465) are shown above the diagonal.

Table 3
Two-dimensional ALSCAL solutions for the Chinese Vocational Interest Inventory

| | Male (N=366) | | Female (N=465) | |
|---|---|---|---|---|
| Scale | Dimension 1 | Dimension 2 | Dimension 1 | Dimension 2 |
| R | 1.4335 | 0.4287 | 2.0700 | 0.1369 |
| I | 1.5902 | 0.2011 | 1.2116 | 0.3811 |
| A | -0.6215 | -1.6277 | -0.9460 | 0.3802 |
| S | -0.8561 | -0.3943 | -1.5855 | 0.1178 |
| E | -1.5158 | 0.7125 | -0.6919 | 0.2774 |
| C | -0.0304 | 0.6798 | -0.0582 | -1.1885 |

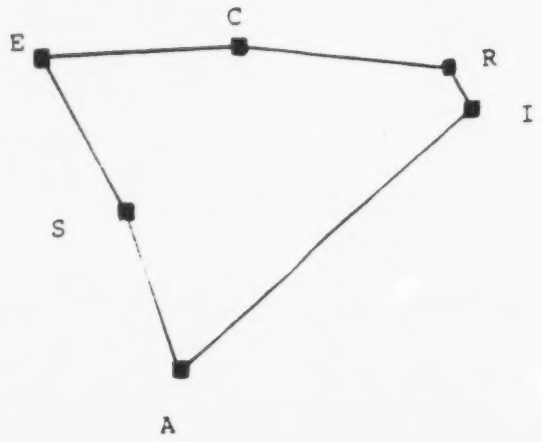


Figure 1. Two-dimensional configuration for the Chinese Vocational Interest Inventory based on the sample of 366 male college students. (stress=0.027 and RSQ=0.995)

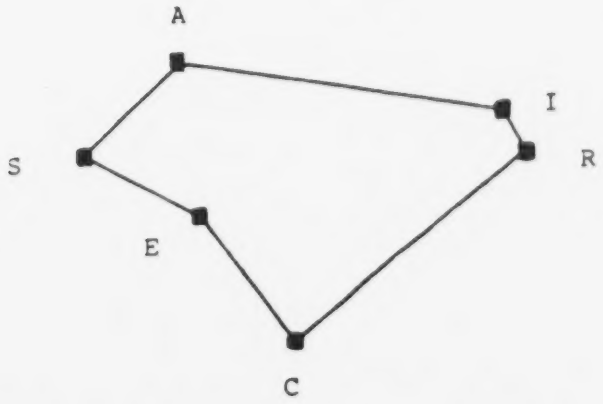


Figure 2. Two-dimensional configuration for the Chinese Vocational Interest Inventory based on the sample of 465 female college students. (stress=.019 and RSQ=.998)